United States
Department of
Agriculture

Forest Service
Northeastern Area

Admin. Report
82-8

FOREST PEST MANAGEMENT

1981 NURSERY REPORT

Prepared by:

CATHERINE F. CROGHAN, Pathologist

INTRODUCTION

This report summarizes Forest Pest Management nursery activities at the St. Paul Field Office area during 1981. Our nursery work includes direct involvement with federal nurseries, cooperative projects with states, universities, and other federal agencies, and answering pest surveillance reports sent in by forest nursery managers within a six state area 1/. The following activities are covered:

Walnut Seed Soft Rot Survey of Two Midwestern Nurseries
Survey for Endemic Nursery Mycorrhizae
National Mycorrhizae Pilot Test
Evaluation of White Spruce Stunting, Eveleth Nursery
Sirococcus Shoot Blight Survey, Toumey Nursery
Diplodia Tip Blight Detection Survey, Eveleth Nursery
1981 Nursery Pest Surveillance Reports

WALNUT SEED SOFT ROT SURVEY IN TWO MIDWESTERN NURSERIES

In the fall of 1979, 700,000 walnut seeds were planted at the Wilson Nursery, Boscobel, WI. At the typical germination rate of 50 percent, the expected crop was 350,000 seedlings. However, the germination rate in 1980 was only 20 percent. Upon examination, many of the non-germinated seed were found to contain bacterial soft rot. Because of the soft rot, fewer than 150,000 1-0 seedlings were available for outplanting in the spring of 1981. At 11 cents per seedling, the difference between expected and realized crop value was $22,000.

As part of our cooperative pathology effort with the Wisconsin Department of Natural Resources, Forest Pest Management conducted a survey for walnut seed soft rot in two additional nurseries: Iowa State at Ames, Iowa and General Andrews at Willow River, Minnesota. The survey was conducted to determine if walnut seed rot was occurring at other nurseries in the region and to determine if particular seed and seedbed preparation practices were associated with high levels of soft rot.

Bacterial soft rot was found at both the Iowa State and General Andrews Nurseries. The percent walnut seed soft rot at the General Andrews Nursery (56%) was comparable with that observed for the Wilson Nursery (43%). However, the incidence of soft rot at the Iowa State Nursery (20%) was considerably less than Wilson Nursery.

1/ The six state area includes: Illinois, Iowa, Michigan, Minnesota, Missouri, and Wisconsin.

An examination of the cultural practices at the 3 nurseries showed many similarities between the General Andrews and Wilson Nurseries. The primary difference between these two nurseries and the Iowa State Nursery was in the manner of seed preparation and seeding. Unlike the General Andrews and Wilson Nurseries, Iowa State did not husk its seed. Also, rather than covering the seeds with soil, Iowa State mulched the seedbeds with corn cobs.

The results of this survey indicate that while soft rot is present in all three nurseries examined, cultural practices such as husking and sowing technique may be associated with increased incidence. We have recommended that a single seed lot be evaluated for the effects of husking and sowing technique on percent microbial colonization, specifically bacterial soft rot.

SURVEY FOR ENDEMIC NURSERY MYCORRHIZAE

The endemic nursery mycorrhizae survey was initiated in 1980 to identify species of known mycorrhizae forming fungi that occur in the forest tree nurseries of the region. The results for the 2nd year of this 3 year survey are summarized below:

Nurseries in Iowa, Michigan, Minnesota, and Wisconsin participated; with six State and two Federal nurseries making collections (Table 1). Collections received in 1981 included six species that are known to be mycorrhizal associates: Boletus sp., Thelephora terrestris Ehrh. ex Fr., Hebeloma arenosum [2], Laccaria laccata (Fr.) Berk and Br. Inocybe sp., and Tylopilus fellius (Bull. ex Fr.) Karst. As in 1980, T. terrestus, L. Laccata and H. arenosum were received from all participating nurseries. T. felleus was the only new species collected in the 1981 survey.

Collections were made in nursery beds of six different tree species. These included white spruce, black spruce, Norway spruce, red pine, jack pine, and Eastern white pine. The Hebeloma occurred in association with all six species (Table 2). The Boletus sp. and the T. felleus were each found with only one tree species (red pine and white pine, respectively).

The Inocybe sp., T. felleus, and Boletus sp. collections were much less frequent than the other three fungal species. It should be pointed out however, that this low frequency may not be a reflection of the actual appearance in the nursery beds but a reflection of color, size, and persistence of the mushrooms. A bright colored, large fruiting body that resists decay is much more likely to be collected than one that lacks these characteristics.

[2]/ H. arenosum is a new species name. It will be published in the forthcoming A. H. Smith/L. R. Hesler Hebeloma monograph. The description is based on collections made by M. Albers, Pest Specialist, Minnesota Department of Natural Resources, at the Griffith Nursery in Wisconsin Rapids, Wisconsin and on a collection from Oregon.

NATIONAL MYCORRHIZAE PILOT TEST

The National Mycorrhizae Pilot Test was begun in the late 1970's. The objective was to evaluate the performance of Pisolithus tinctorius (Pers.) Coker and Couch (Pt.) inoculated conifer stock both in the nursery and the field (10 year follow up). The nursery phase for all Northeastern Area study areas is complete and 1 and 2 years of data have been analyzed for the outplantings. The results are presented below:

NURSERY PHASE

Three seedling parameters were statistically analyzed for differences between inoculated and control plots (Table 1). Out of seven participating nurseries, two had significant increases in top height, one had increased stem diameter, and four had increased total tree weight for the Pt inoculated stock.

Table 1.--Significant differences* between inoculated and uninoculated nursery stock.

Nursery Location	Pine	Height	Stem Diameter	Total Weight
Parsons, WV	White	-**	-	-
Cloquet, MN	Red	+***	-	+
Newaygo, MI	Red	-	-	-
Port Edwards, WI	Red	+	-	+
Licking, MO	Shortleaf	-	-	-
Jonesboro, IL	Loblolly	-	+	+
Vallonia, IN	Virginia	-	-	+

* p = .05
** - = significant difference
*** + = no significant difference

OUTPLANTING PHASE

The outplantings are being evaluated in two ways, percent survival and plot volume index (PVI) (PVI = seedling volume X number surviving seedlings).

First year data are available for two of the seven outplantings in the Northeastern Area. These data show no significant increase in survival of inoculated over control plots (Table 2). At the Newaygo, MI planting PVI was significantly larger for the control plots when compared with Georgia inoculum treatment (GA 100 = 100 ml inoculum/ft^2 of nursery seedbed) and comparable to the Abbott inoculum treatment (ABB 200 = 200 ml inoculum/ft.^{2}of nursery seedbed)(Table 3).

Table 2.--Mean percent survival for National Mycorrhizae Evaluation seedlings following first field growing season.

Source of stock	Treatment		
	GA 100	ABB 200	Control
Parsons, WV	81	--	82
Newaygo, MI	93	89	83

Table 3.--Mean plot volume index (PVI) for National Mycorrhizae Evaluation seedlings following first year of outplanting.

Treatment	Parsons WV	Newaygo MI
Control	171	197a*
GA 100	183	150b
ABB 200	---	188ab

* Means in a column followed by the same letter do not differ significantly (p = 0.05).

First and second year data are available for five sites. No significant increase in survival of inoculated stock was noted (Table 4). A significant increase in PVI was observed for inoculated trees at the Missouri outplanting in the first year (Table 5). However, this difference in growth had disappeared by the end of the second growing season. The Cloquet, MN planting shows a significant increase in PVI for inoculated over control plots for both the first and second growing seasons. However, the validity of these results is questionable as this is a dry, sloped site and four of the five control treatment plots are at the top of the slope. Moisture availability may well be influencing tree performance.

Table 4.--Mean percent survival for National Mycorrhizae Evaluation seedlings following first and second field growing seasons.

Treatment	Cloquet, MN	Licking, MO	Jonesboro, IL	Port Edwards, WI	Vallonia, IN
1st Year					
Control	90	91	72	96	--
GA 100	98	92	74	98	--
ABB 200	--	--	--	--	--
2nd Year					
Control	89	68	73	79	68
GA 100	97	68	78	91	74
ABB 200	--	--	--	89	68

Table 5.--Mean Plot volume index (PVI) for National Mycorrhizae Evaluation seedlings following first and second year of outplanting.

Treatment	Cloquet, MN	Licking, MO	Jonesboro, IL	Port Edwards, WI	Vallonia IN
1st Year					
Control	55a*	150a	280	83	--
GA 100	92b	217b	321	102	--
ABB 200	---	---	---	89	--
2nd Year					
Control	177a	1,148	1,128	288	1,305a
GA 100	304b	1,388	1,273	233	1,097ab
ABB 200	---	---	---	235	617b

* Means in a column followed by the same letter do not differ significantly ($p = 0.05$).

Thus far, the field performance of Pt inoculated stock in the Northeastern Area has not been encouraging. Other than the Cloqet, MN outplanting, significant increases in growth of inoculated stock has been limited to tests in the southern tier of Northeastern Area states using southern pine species. Field performance will continue to be monitored through the 10th year.

EVALUATION OF WHITE SPRUCE STUNTING, EVELETH NURSERY

Stunting and purple discoloration of 1-0 white spruce and red pine seedlings has been observed in tree nurseries of the Lake States region for a number of years. However, dollar losses associated with the stunting syndrome have not been documented. In 1978, study plots were established in 1-0 white spruce beds at Eveleth Nursery in Eveleth, MN to determine the impact of stunting on seedling production and to determine if stunted seedlings were associated with soil and/or foliar nutrient imbalances.

In the fall of 1978, 28 percent of the 2.5 million 1-0 white spruce seedlings were stunted. At the 3-0 lifting stage, 27.6 percent of those stunted seedlings were culled due to small size while only 5.4 percent of the non-stunted seedlings were culled. At a cost of $63.00/1000 trees, the loss due to stunting of the white spruce crop lifted in 1981 was $9,800.

The foliage of stunted 1-0 seedlings was found to have low phosphorus (P) levels compared to non-stunted seedlings. Levels of P in the soil associated with both stunted and non-stunted seedlings were within the recommended range for growing white spruce. No explanation for the seedling P deficiency could be given.

Additional 1-0 white spruce and red pine stunting plots were established during the 1980 and 1981 field seasons at Eveleth Nursery. These plots will be evaluated at lifting to further assess the dollar losses associated with stunting.

SIROCOCCUS SHOOT BLIGHT SURVEY, TOUMEY NURSERY

In August, 1981 a survey was conducted at the Toumey Nursery in Watersmeet, MI. for Sirococcus shoot blight (Sirococcus strobilinus Preuss.). The survey was a follow-up to a 1980 survey conducted in conjunction with spore trapping and fungicide tests completed by Dr. Tom Nicholls of the North Central Forest Experiment Station. The 1980 survey identified infected perimeter red pines which were subsequently either pruned or removed. The 1981 survey identified trees that had become symptomatic since the initial survey.

No jack pines were found to be infected, however, 11 red pines were added to the 21 Sirococcus infected trees recorded in 1980. Most of these new trees showed only light infection. A combination of tree removal and pruning was recommended to control inoculum in the vicinity of the nursery beds.

In most cases the removal or pruning of infected trees following the 1980 survey appears to have been successful in retarding the

spread of Sirococcus shoot blight to adjacent trees. With continued monitoring of the windrows surrounding the nursery and the initiation of a chlorothalonil spray program in 1981, good control of the disease should be possible at Toumey Nursery.

DIPLODIA TIP BLIGHT DETECTION SURVEY, EVELETH NURSERY

In November, 1980 Diplodia tip blight (Diplodia pinea (Desm.) Kickx) was identified on 1-0 red pine seedlings in block 1 of the Eveleth Nursery in Eveleth, MN. Because infection was low (less than 1 percent), roguing of infected seedlings was recommended to control the spread of this pest within the Nursery. This was completed in May, 1981. Subsequent examination of the 1-0 red pine seedlings in block 1 indicated that roguing successfully controlled the spread of this pathogen.

A survey of the red pine and white spruce windbreaks and mature red and jack pines surrounding the nursery showed no major source of D. pinea inoculum. Both shoots and cones were examined. Although Diplodia tip blight was identified on several large red pine in the vicinity of the Nursery office, there was inadequate inoculum at that location to explain the amount of infection in the beds of block 1. Nursery beds will continue to be monitored for Diplodia infection in 1982.

1981 NURSERY PEST SURVEILLANCE REPORTS

During 1981 we received 16 requests for diagnosis and identification of nursery pest problems. They are listed below by nursery, host species, and pest:

Nursery	Tree Species	Pest
Eveleth, Superior NF, MN	Jack Pine	Winter burn
	Eastern white pine	White grub
	Red pine	Diplodia tip blight
General Andrews, Willow River, MN	Northern red oak & jack pine	Pine-oak gall rust
Iowa State, Ames, IA	Russian olive	Cutworms
Red Lake Indian Res., MN	Jack pine	Unknown
	Red pine	Army worms
Toumey, Ottawa NF, MI	Northern red oak	Fertilizer burn
	Horse chestnut	Guignardia aesculi leaf spot
	Birch	Chemical Injury
	Balsam fir	Unknown
	Jack pine	Sirococcus shoot blight
	Red pine	Unknown
	Spruce	Cutworms
Wyman, Manistique, MI	White spruce	Suspected herbicide burn